English translation of cited reference, Korean Patent No. 0153605

Title of the invention: REMOTE VEHICLE MANAGEMENT SYSTEM

Patentee : Samsung Electronics

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[Abstract]

The present invention relates to a system for remotely managing vehicles. The present invention provides a system for diagnosing troubles and malfunctions of a vehicle to be managed to thereby notify a driver of a diagnosis result as well as provide troubleshooting information and maintenance information in accordance with the diagnose result.

A remote vehicle management system in accordance with the present invention has a central control station for managing a plurality of vehicles, and each vehicle and the central control station have units enabling bidirectional communication therebetween, respectively. Cellular phones, car phones, wireless faxes and digital cellular pones which permit the data transmission using radio frequencies can be used as the bidirectional communication units. In addition, the central control station previously stores information on management target vehicles, troubleshooting information to cope with a vehicle in accordance with its state, vehicle maintenance information and location information on service centers enabling vehicle repairs.

[Representative drawing]

Figure 4

[Title of Invention]

REMOTE VEHICLE MANAGEMENT SYSTEM

[Brief description of the Drawings]

Figure 1 illustrates an AVC device and an electric equipment control device which are connected to a conventional vehicle navigation device;

Figure 2 shows in detail a construction of the AVC device in Figure 1;

Figure 3 is a construction view showing a remote vehicle management system in accordance with the present invention;

Figure 4 shows a combined construction of a central control station and the vehicle navigation device which constitute the remote vehicle management system in accordance with the present invention;

Figure 5 is a process flowchart of the central control station for performing a remote vehicle control operation in accordance with the present invention; and

Figure 6 is a process flowchart of the vehicle navigation device in conjunction with the operation of the central control station in Figure 5.

**** Explanation for the major reference numerals****

110: GPS information receiving unit	111: sensor unit
112: location computing unit	113: map data storage unit
114: input operating unit	115: display unit
116: system control unit	120: interface
140: electric control device	300: central control station

[Detailed description of the invention]

The present invention relates to a system for remotely controlling vehicles, and more particularly, to a system for diagnosing troubles and malfunctions of a

vehicle to be managed to thereby notify a driver of a diagnosis result as well as provide troubleshooting information and maintenance information corresponding to the diagnosis result.

Navigation devices which may be GPS positioning devices for checking the present positions and moving speeds of moving objects such as ships, aircrafts and cars or for determining moving paths have been mounted on the moving objects. This GPS positioning device receives radio waves indicating latitude, longitude, elevation and the like from a plurality of satellites belonging to the Global Positioning System, computes the present position of the moving object using the received radio waves, a speed detecting sensor and a direction detecting sensor, and then displays map information including the present position. That is, a conventional navigation device displays the present position of the moving object computed in accordance with information received from the GPS on a map displayed on a display screen. In addition, the navigation device provides the driver with driving information such as a driving direction of the moving object, a distance to its destination, the present speed of the moving object, the maximum speed limit of the vehicle during the driving, a path set by driver before driving, a recommended path to its destination provided from the navigation device, etc.

Meanwhile, additional units such as an AVC (Audio, Video and Carphone) device or an electric control device are connected to a navigation device according to the recent trends, thereby providing better driving environments to the driver. A typical internal construction of a vehicle for implementing such driving environments is shown in Figure 1.

With reference to Figure 1, a typical navigation device includes a GPS information receiving unit 110, a sensor unit 111, a location computing unit 112, a

map data storage unit 113, an input operating unit 114, a display unit 115 and a system control unit 116. An operation of the navigation device having such a construction is performed as follows. The GPS information receiving unit 110 receives radio waves from a plurality of satellites belonging to the GPS through an antenna (AT) and computes a pseudo-coordinate value of the present location. The sensor unit 111 includes a gyro-sensor and a speed sensor, and detects an angle of rotation and speed of the vehicle by the gyro-sensor and the speed sensor. The location computing unit 112 computes the present pseudo location of the vehicle on the basis of the angle of rotation and the speed of the vehicle which are supplied from the sensor unit 111, and furthermore selects one of the pseudo-coordinate value of the present location supplied from the GPS information receiving unit 110 and the computed pseudo location. At this time, the selection is determined depending on a cumulative error: the computed value is selected if the cumulative error from the sensor unit 111 is small, otherwise if the cumulative error is large, the error is corrected by the value supplied from the GPS information receiving unit 110. Then, the location computing unit 112 may compute the present location of the vehicle as well as driving information such as the speed and heading direction of the vehicle. The finally computed driving information of the vehicle is supplied to the system control unit 116. The map data storage unit 113 stores map data and other additional information data. The input operating unit 114 is provided with a plurality of keys including a confirmation button for confirming driving information on another vehicle and numeral keys, and therefore makes it possible for a vehicle driver to confirm the driving information on another vehicle. The display unit 115 displays map information read from the map data storage unit 113 as well as multiple states occurring when various functions of the

navigation device are performed. The system control unit 116 controls overall operations of the navigation device: reading map data of the surrounding area from the map data storage unit 113 on the basis of the driving information received from the location computing unit 112 and, displaying the read map data on the display unit 115.

In Figure 1, the navigation device is connected through an interface 120 to the AVC device 130 and an electric equipment control device 140. As shown in Figure 2 in detail, the AVC device 130 includes an AVC control unit 131, a video unit 132, an audio unit 133, a mobile phone unit 134 and a remote control 135. The electric equipment control device 140 includes a vehicle state detection unit 141, an electric equipment unit 142 and an electric equipment control unit 143.

With reference to Figure 2, the video unit 132 includes a television (TV) tuner 132A receiving television (TV) signals, a signal processing unit 132B for processing TV signals to thereby output RGB signals and audio signals; and a CRT(Cathode Ray Tube) 132C for displaying the RGB signals outputted from the signal processing unit 132B. The audio unit 133 includes a radio tuner amp 133a for receiving radio signals, a cassette deck 133B, a compact disc player 133C and a speaker 133D. The speaker 133D outputs to the outside audio signals reproduced from the radio tuner amp 133A, the cassette deck 133B and the CDP 133C as well as audio signals outputted from the signal processing unit 132B of the video unit 132. The mobile phone unit 134 includes a mobile phone 134A for communications with the other party on the outside and a phone control unit 1348 for outputting voice of the other party to the speaker 133D of the audio unit 133 during hand-free calls with the other party on the outside. In case the AVC device 130 is made up of the video unit 132, the audio unit 133 and the mobile phone unit

134, an operation of the AVC device 130 is controlled by the AVC control unit 131 receiving key signals generated according to driver's operation of the remote control 135. Figure 2 shows that the key signal generated from the remote control 135 is supplied to the AVC control unit 131. In case the AVC device 130 is connected to the navigation device through the interface 120 of Figure 1, the key signal generally generated from the remote control 135 is supplied to the system control unit 116. Accordingly, using the remote control 135, the driver can control not only the AVC device 130 but also the navigation device and the electric equipment control device 140.

Meanwhile, by connecting the AVC device 130 and the electric equipment control device 140 through the interface 120 to the system control unit 116 of the navigation device, the driver can make reservations for operations of the video unit 132 and the audio unit 133 of the AVC device 130 using the navigation device so that a desired operation can be performed while driving. In addition, since troubles and malfunctions of the vehicle are detected in the vehicle state detection unit 141 of the electric equipment control device 140, the system control unit 116 of the navigation device periodically diagnoses a state of the vehicle state detection unit 141, and in case the vehicle is out of order and malfunctions, notifies the driver of the troubles and malfunctions by means of the display unit 115 of the navigation device, the CRT 132C of the video unit 132 of the AVC device 130 or the speaker 133D of the audio unit 133. Moreover, since the electric equipment unit 142, which can be of various kinds of electric equipments to be installed in the vehicle, is connected to the system control unit 116 of the navigation device through the electric equipment control unit 143, the driver can control operations of the various kinds of electric equipments.

By connecting the AVC device and the electric equipment control device to the navigation device, the driver can check troubles and malfunctions of the vehicle (hereinafter, called "vehicle state") and take measures if possible.

However, in such a conventional system as described above, since information on makeshift measures or troubleshooting ways in accordance with a vehicle state is not provided, a driver cannot deal with such a situation and in this case, the driver should look for a repair shop or a service center. If the driver does not know where it is, the driver gets into more trouble. Inexperienced drivers meet such situations more often rather than experienced drivers.

Accordingly, an object of the present invention is to provide a system for remotely diagnosing a state of a vehicle to be managed and then notifying the diagnosis result.

Other object of the present invention is to provide a system for remotely diagnosing a state of a vehicle to be managed, notifying the diagnosis result and informing the most adjacent service center.

Another object of the present invention is to provide a system for remotely diagnosing a state of a vehicle to be managed, notifying a diagnosis result and making a reservation such that measures on the vehicle can be taken by the most adjacent service center.

A further object of the present invention is to provide a system for providing maintenance information corresponding to maintenance period of a vehicle to be managed.

To achieve these and other objects of the present invention, there is provided a remote vehicle management system comprising a central control station for managing a plurality of vehicles, and each vehicle and the central

control station have units enabling bidirectional communication therebetween, respectively. Cellular phones, car phones, wireless faxes and digital cellular pones which permit the data transmission using radio frequencies can be used as the bidirectional communication units. In case that a telephone is used, it can be able to be interfaced with a modem which is a data modulator-demodulator unit. In addition, the central control station previously stores information on management target vehicles, troubleshooting information to cope with a vehicle in accordance with its state, vehicle maintenance information and location information on service centers enabling vehicle repairs.

A remote vehicle management system in accordance with the first object of the present invention, comprising: a plurality of management target vehicles each having a vehicle state detection unit for detecting states of various devices in the vehicle and a bidirectional communication unit for converting a vehicle state detected by the vehicle state detection unit into radio data and transmitting the converted radio data upon receiving a vehicle diagnosis request signal; and a central control station including a storage unit for storing information on each of the management target vehicles and troubleshooting information to cope with each vehicle in accordance with its multiple states, and a bidirectional communication unit for periodically sending a diagnosis request signal to each of the management target vehicles stored in the storage unit, diagnosing a vehicle state by examining the radio data received in response to the sent diagnosis request signal, converting a diagnosis result and troubleshooting information suitable for the diagnosis result, which is selected from the storage unit, into radio data and notifying the corresponding vehicle of the converted radio data.

A remote vehicle management system in accordance with the second

object of the present invention, comprising: a plurality of management target vehicles each having a vehicle state detection unit for detecting states of various devices in the vehicle, an vehicle location computing unit for computing the present location of the vehicle, and a first bidirectional communication unit for modulating a vehicle state detected by the vehicle state detection unit into first radio data and transmitting the first radio data upon receiving a vehicle diagnosis request signal, and for modulating the present location of the vehicle computed by the vehicle location computing unit into second radio data and transmitting the second radio data; and a central control station including a storage unit for storing information on each of the management target vehicles and location information on service centers for vehicle repairs, and a second bidirectional communication unit for periodically sending a diagnosis request signal to each of the management target vehicles stored in the storage unit, diagnosing a vehicle state by examining the first radio data received in response to the sent diagnosis request signal, modulating a diagnosis result and the vehicle location information request signal into third radio data and notifying the corresponding vehicle of the third radio data, determining location information on the most adjacent service center to the corresponding vehicle by examining the second radio data received in response to the sent vehicle location information request signal, modulating the determined location information on the service center into fourth radio data and notifying the corresponding vehicle of the fourth radio data.

A remote vehicle management system in accordance with the third object of the present invention, comprising: a plurality of management target vehicles; and a central control station including a storage unit for storing histories of the management target vehicles and maintenance information in accordance with the

histories of the vehicles, and a communication unit for notifying the corresponding management target vehicles of maintenance information required when it is time for vehicle maintenance by examining the histories of the management target vehicles stored in the storage unit.

Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings with detailed descriptions.

Detailed description of a preferred embodiment

With reference to Figure 3, a remote vehicle management system according to the present invention comprises a central control station 300 for controlling the overall operation of the remote vehicle management system, a plurality of vehicles 311 to 314 remotely controlled based on the corresponding information being stored in the central control station 300 and service centers 321 to 324 enabling repairs of the vehicles.

Figure 4 is a view showing in detail the connection between the central control station 300 and a vehicle navigation device, which constitute the remote vehicle management system as shown in Figure 3. With reference to Figure 4, there are included bidirectional communication units 150 and 300 which allow bidirectional communication between the vehicles and the central control station. As described above, cellular phones, car phones, wireless faxes and digital cellular pones which permit the transmission and reception of data using radio frequencies can be used as wireless transmission and reception units 152 and 302 of the bidirectional communication units 150 and 300. Such wireless transmission and reception units 152 and 302 allow the transmission and reception of radio data as well as telephone calls between the transmitting and

receiving parties. In addition, the data received by radio is connected by wire to modulator-demodulator units 153 and 303 in the bidirectional communication units 150 and 300.

The vehicle navigation device according to the present invention is connected through an interface 120 to an AVC device 130 and an electric equipment control unit 140, as shown in Figure 1. However, Figure 4 illustrates not the entire AVC device 130, but only the bidirectional communication unit 150 directly related to the present invention. This bidirectional communication unit 150 substitutes for a mobile phone unit 134 of Figure 1. In addition, it is noted that in case the AVC device is connected to the navigation device, an AVC control unit 131 and a CRT (Cathode Ray Tube) unit 132C (shown in Figure 2) as a display unit 132 of Figure 1 can be implemented by a system control unit 116 and a display unit 115 and therefore are not separately illustrated.

With reference to Figure 4, the bidirectional communication unit 150 mounted on the vehicle includes an antenna 151, a wireless transmission and reception unit 152, a data modulator-demodulator unit 153, a communication control unit 154 and an auxiliary storage unit 155. The bidirectional communication unit 300 of the central control station includes an antenna 301, a wireless transmission and reception unit 302, a data modulator-demodulator unit 303, a communication control unit 304 and a management information storage unit 305.

As shown in Figure 5, the communication control unit 304 of the central control station controls and processes operations in accordance with programs. As shown in Figure 6, the communication control unit 154 of the vehicle controls and processes operations in accordance with programs. Data processed during the transmission and reception is stored in the auxiliary storage unit 155, and histories

(e.g., registration number, delivery date (yyyy-mm-dd), maintenance period, etc) of vehicles to be managed are stored in the management information storage unit 305. Moreover, troubleshooting information to cope with a vehicle in accordance with its state, maintenance information in accordance with its maintenance period, and location information of the service centers are stored in the management information storage unit 305. Operations of such bidirectional communication units 150 and 300 will be described in detail below.

If a request signal is transmitted at step 502 of Figure 5 such that the communication control unit 304 may diagnose the vehicle to be managed, the communication control unit 154 of the corresponding vehicle checks at step 602 of Figure 6 whether or not the vehicle diagnosis request signal is received. Upon receiving this vehicle diagnosis request signal, the communication control unit 154 sends an ACK signal indicating that the vehicle diagnosis request signal has been received at step 604, and diagnoses the vehicle using signals detected in a vehicle state detection unit 141 at step 606. At this time, the communication control unit 304 checks at step 504 whether or not the ACK signal is received. If it is checked that the ACK signal is received, the communication control unit 304 determines at step 510 that the corresponding vehicle is being diagnosed. However, in case that the ACK signal is not received, remote diagnosis request signals are retransmitted by a preset number of times (n). If the ACK signal is not received in spite that the remote diagnosis request signals were transmitted by a preset number of times (n), the communication control unit 304 determines that the power is not supplied to the AVC device of the vehicle or that the AVC device is performing another operation having a higher priority, and stops the transmission of the remote diagnosis request signals at step 508.

The communication control unit 154 of the vehicle diagnoses a state of the vehicle using a detection signal outputted from the vehicle state detection unit 141. Thereafter, at step 608, the communication control unit 154 stores a diagnosis result in the auxiliary storage unit 155 and displays the diagnosis result on the display unit 115. In addition, the communication control unit 154 supplies data corresponding to the diagnosis result to the data modulator-demodulator unit 153. Then, the data modulator unit 153 modulates and outputs the data corresponding to the diagnosis result. The outputted data passes through the wireless transmission and reception unit 152 and the antenna 151, and are propagated in the air as radio data. The propagated radio data passes the antenna 310 and is received in the wireless transmission and reception unit 302 of the central control station. The data modulator-demodulator unit 303 demodulates the received radio data. At step 512, the communication control unit 304 checks whether the data having been demodulated and outputted from the data modulator-demodulator unit 303 exits. In case that the outputted data exits, the communication control unit 304 checks the diagnosis result at step 514. The checked diagnosis result shows that the vehicle may be out of order or in order. Such determination is performed at step 516. In case that the diagnosis result shows that the vehicle is out of order, it proceeds to step 526. In case that the diagnosis result shows that the vehicle in order, it proceeds to a step 518. At step 518 and 520, in case that the vehicle is in order, the communication control unit 304 examines the history of the vehicle to be managed stored in the management information storage unit 305 and checks whether it is time for the vehicle maintenance in accordance with the purchase date and information of the odometer. In case that it is time for the vehicle maintenance, the communication control unit 304 notifies the corresponding

vehicle of the corresponding maintenance information such as information indicating the time for changing oil or the time for changing belt. The notified maintenance information is demodulated by the data modulator-demodulator unit 153. At step 612, the communication control unit 154 stores the data modulated by the data modulator-demodulator unit 153 in the auxiliary storage unit 155 and sends an ACK signal. The maintenance information stored in the auxiliary storage unit 155 is supplied to the system control unit 116 through the interface 120. At step 614, the system control unit 116 converts the supplied maintenance information into display data and displays the converted display data on the display unit 115. Accordingly, a vehicle driver can be informed that it is time for vehicle maintenance.

In case that it is determined that the vehicle is out of order, the communication control unit 304 determines at step 526 whether or not the driver can deal with troubles and malfunctions. The determination can be made by the user who identifies the troubles and malfunctions which the user can deal with and the troubles and malfunctions which the user cannot deal with when storing the troubles and malfunctions in the management information storage unit 305 in advance. At step 528, in case of the troubles and malfunctions which the user can deal with, the communication control unit 304 reads troubleshooting information for the vehicle from the management information storage unit 305 and notifies the corresponding vehicle of the read information. The notified troubleshooting information for the vehicle is demodulated by the data modulator-demodulator unit 153. At step 616, the communication control unit 154 sends an ACK signal. At step 618, the system control unit 116 converts the troubleshooting information for the vehicle supplied through the interface 120 into display data and displays the

converted display data on the display unit 115. Accordingly, the driver can be informed that the vehicle is out of order and can deal with the troubles and malfunctions on the basis of the notified troubleshooting information for the vehicle.

Meanwhile, in case that it is determined that the driver has difficulty in dealing with the troubles and malfunctions, the communication control unit 304 sends a location information transmission request signal at step 532. Then, at step 620, the system control unit 116 operates the present location of the vehicle by using a location computing unit 112 and then at step 622, sends the computed present location as location information to the central control station. In case the location information is received, at step 536, the communication control unit 304 discovers the location of the corresponding vehicle by using the received location information and then searches for a service center which is the most adjacent to the vehicle from the management information storage unit 305. The location information of the service center found at step 536 is sent to the vehicle at step 538. If it is determined at step 624 that the location information of the service center is received, the system control unit 116 computes the location of the service center and displays the location of the service center in addition to the present position of the vehicle on the display unit 115. At this time, map data corresponding to the present location of the vehicle is read from a map data storage unit 113 and displayed on the display unit 115. At this time, the driver can check where the most adjacent service center is located and besides can request the services by operating keys on an input operating unit 114.

If it is determined at step 628 that there is a key input for requesting the services from the driver, the communication control unit 154 sends the corresponding service request signal requested by the driver to the central control

station at step 630. If it is checked that the service request signal is received, at step 540, the communication control unit 304 of the central control station makes a reservation for the requested services at step 542. At this time, the requested services may be prearranging a vehicle in the service center or calling out a vehicle of the service center. After making a reservation for the services requested by the user in the service center, the communication control unit 304 sends a reservation result signal to the corresponding vehicle at step 544. If it is checked that the reservation result signal is received, the communication control unit 154 sends an ACK signal to the central control station and then carries out a general vehicle driving mode.

Accordingly, the driver can check where the service center which is the most adjacent to the vehicle is located, and besides can promptly repair the troubles and malfunctions because the user can request prearrangement and moving out in the service center.

As described above, with the implementation of a central control station capable of remote-diagnosing vehicles to be managed, the corresponding vehicle can be provided troubleshooting information when the troubles and malfunctions occur and a vehicle driver can prearrange a vehicle in the service center in case the troubles and malfunctions are serious. Accordingly, there is an advantage that the troubles and malfunctions of the vehicle can be promptly remedied. In addition, as the vehicle driver is notified that it is time for vehicle maintenance by examining a history of the vehicle, the driver can advantageously perform the vehicle maintenance in time.

Accordingly, the driver can check where the most adjacent service center to the vehicle is located, and besides can promptly repair the troubles and

malfunctions because the user can request prearrangement and moving out in the service center.

As described above, with the implementation of a central control station capable of remote-diagnosing vehicles to be managed, the corresponding vehicle can be provided with troubleshooting information when the troubles and malfunctions occur and a vehicle driver can prearrange a vehicle in the service center in case the troubles and malfunctions are serious. Accordingly, there is an advantage that the troubles and malfunctions of the vehicle can be promptly remedied. In addition, as the vehicle driver is notified that it is time for vehicle maintenance by examining a history of the vehicle, the driver can advantageously perform the vehicle maintenance in time.

Meanwhile, as the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A remote vehicle management system, comprising:

a plurality of management target vehicles each having a vehicle state detection unit for detecting states of various devices in the vehicle and a bidirectional communication unit for converting a vehicle state detected by the vehicle state detection unit into radio data and transmitting the converted radio data upon receiving a vehicle diagnosis request signal; and

a central control station including a storage unit for storing information on each of the management target vehicles and troubleshooting information to cope with each vehicle in accordance with its multiple states, and a bidirectional communication unit for periodically sending a diagnosis request signal to each of the management target vehicles stored in the storage unit, diagnosing a vehicle state by examining the radio data received in response to the sent diagnosis request signal, converting a diagnosis result and troubleshooting information suitable for the diagnosis result, which is selected from the storage unit, into radio data and notifying the corresponding vehicle of the converted radio data.

2. The system of claim 1, wherein when the radio data is notified from the bidirectional communication unit of the central control station, the bidirectional communication unit of each vehicle to be managed demodulates the notified radio data.

3. The system of claim 2, wherein said each vehicle to be managed further comprises:

a data converting unit for converting the radio data having been demodulated by the bidirectional communication unit of the vehicle to be managed into display data; and

a display unit for displaying the display data having been converted by the data converting unit.

4. A remote vehicle management system, comprising:

a plurality of management target vehicles each having a vehicle state detection unit for detecting states of various devices in the vehicle, an vehicle location computing unit for computing the present location of the vehicle, and a first bidirectional communication unit for modulating a vehicle state detected by the vehicle state detection unit into first radio data and transmitting the first radio data upon receiving a vehicle diagnosis request signal, and for modulating the present location of the vehicle computed by the vehicle location computing unit into second radio data and transmitting the second radio data; and

a central control station including a storage unit for storing information on each of the management target vehicles and location information on service centers for vehicle repairs, and a second bidirectional communication unit for periodically sending a diagnosis request signal to each of the management target vehicles stored in the storage unit, diagnosing a vehicle state by examining the first radio data received in response to the sent diagnosis request signal, modulating a diagnosis result and the vehicle location information request signal into third radio data and notifying the corresponding vehicle of the third radio data, determining location information on the most adjacent service center to the corresponding vehicle by examining the second radio data received in response to

the sent vehicle location information request signal, modulating the determined location information on the service center into a fourth radio data and notifying the corresponding vehicle of the fourth radio data.

5. The system of claim 4, wherein when the third and the fourth radio data are notified from the second bidirectional communication unit, the first bidirectional communication unit demodulates the notified radio data.

6. The system of claim 5, wherein said each vehicle to be managed further comprises:

a data converting unit for converting the third and the fourth radio data having been demodulated by the bidirectional communication unit of the vehicle to be managed into display data; and

a display unit for displaying the display data having been converted by the data converting unit.

7. The system of claim 6, wherein said each vehicle to be managed further comprises:

a map data storage unit for storing map data.

8. The system of claim 7, wherein map data containing vehicle location computed by the vehicle location computing unit is read from the map data storage unit and displayed on the display unit, and display data corresponding to fourth radio data having been converted and outputted by the data converting unit is also displayed on the display unit in case the fourth radio

data is notified from the second bidirectional communication unit, so that the present location of the vehicle and location of the most adjacent service center to the vehicle are displayed at the same time.

9. A remote vehicle management system comprising:

a plurality of management target vehicles; and

a central control station including a storage unit for storing histories of the management target vehicles and maintenance information in accordance with the histories of the vehicles, and a communication unit for notifying the corresponding management target vehicles of maintenance information required when it is time for vehicle maintenance by examining the histories of the management target vehicles stored in the storage unit.

10. The system of claim 9, wherein when maintenance information is notified from the communication unit of the central control station, said each vehicle to be managed further comprises a demodulator unit for demodulating the notified maintenance information.

11. The system of claim 10, wherein said each vehicle to be managed further comprises an information converting unit for converting the maintenance information having been demodulated by the demodulator unit into display information and a display unit for displaying the display information having been converted by the information converting unit.

12. A remote vehicle management system comprising:

a plurality of management target vehicles each having a vehicle state detection unit for detecting states of various devices in the vehicle and a first bidirectional communication unit for modulating a vehicle state detected by the vehicle state detection unit into the first radio data and transmitting the first radio data upon receiving a vehicle diagnosis request signal; and

a central control station including a storage unit for storing histories of the management target vehicles and maintenance information in accordance with the histories of the vehicles and troubleshooting information to cope with the vehicles in accordance with their various states, and a second bidirectional communication unit for periodically sending a diagnosis request signal to each of the management target vehicles stored in the storage unit, diagnosing a vehicle state by examining first data received in response to the sent diagnosis request signal, modulating a diagnosis result and troubleshooting information in accordance with the diagnosis result into second radio data and notifying the corresponding vehicle of the second radio data, and modulating maintenance information required when it is time for vehicle maintenance into third radio data and notifying the corresponding management target vehicle of the third radio unit by examining histories of the management target vehicles stored in the storage unit

13. The system of claim 12, wherein the storage unit further stores location information on service centers for vehicle repairs.

14. The system of claim 13, wherein said each vehicle to be managed further comprises a vehicle location computing unit for computing the present location of the vehicle.

15. The system of claim 14, wherein the second bidirectional unit also modulates a vehicle location information request signal into the first radio data and notifies the corresponding vehicle of the first radio data.

16. The system of claim 15, wherein the first bidirectional unit modulates the present location of the vehicle computed by the vehicle location computing unit into fourth radio data and transmits the fourth radio data upon receiving the vehicle location information request signal.

17. The system of claim 16, wherein the bidirectional unit determines location information on the most adjacent service center to the corresponding vehicle by examining the fourth radio data received in response to the sent vehicle location information request signal, and modulates the determined location information of the service center into fifth radio data and notifies the corresponding vehicle of the fifth radio data.

18. The system of claim 17, wherein said each vehicle to be managed further comprises a map data storage unit for storing map data.

19. The system of claim 18, wherein when the second radio data, the third radio data and the fifth radio data are notified from the second bidirectional communication unit, the first bidirectional communication unit demodulates the notified radio data.

20. The system of claim 19, wherein said each vehicle to be managed

further comprises:

a data converting unit for converting the second radio fax data, the third radio data and the fifth radio data having been demodulated by the first bidirectional communication unit into display data; and

a display unit for displaying the display data having been converted by the data converting unit.

21. The system of claim 20, wherein map data containing vehicle location computed by the vehicle location computing unit is read from the map data storage unit and displayed on the display unit, and display data corresponding to the fifth radio data having been converted and outputted by the data converting unit is also displayed on the display unit in case the fifth radio data is notified from the bidirectional communication unit, so that the present location and location of the most adjacent service center to the vehicle are displayed at the same time.

Fig. 1

110 GPS information receiving unit

111 sensor unit

112 location computing unit

113 map data storage unit

114 input operating unit

115 display unit

116 system control unit

120 interface

131 AVC control unit

132 video unit

133 audio unit

134 mobile phone unit

141 vehicle state detection unit

142 electric equipment unit

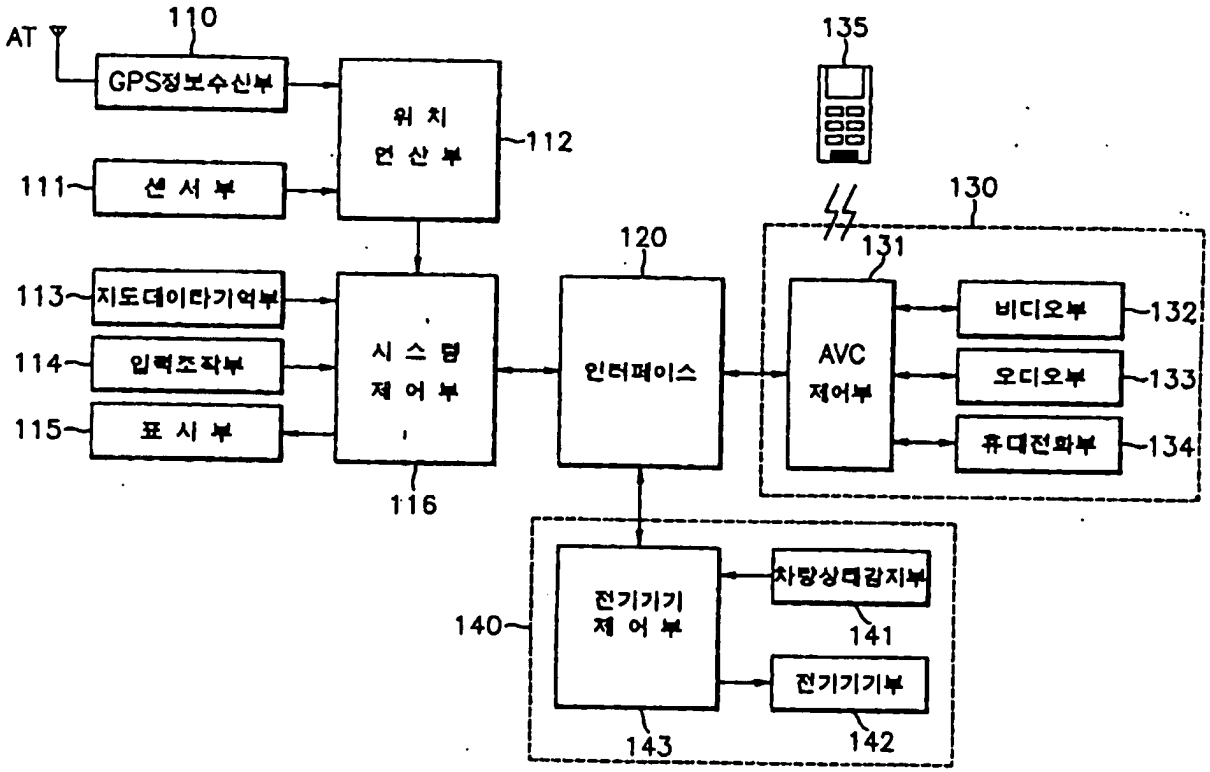
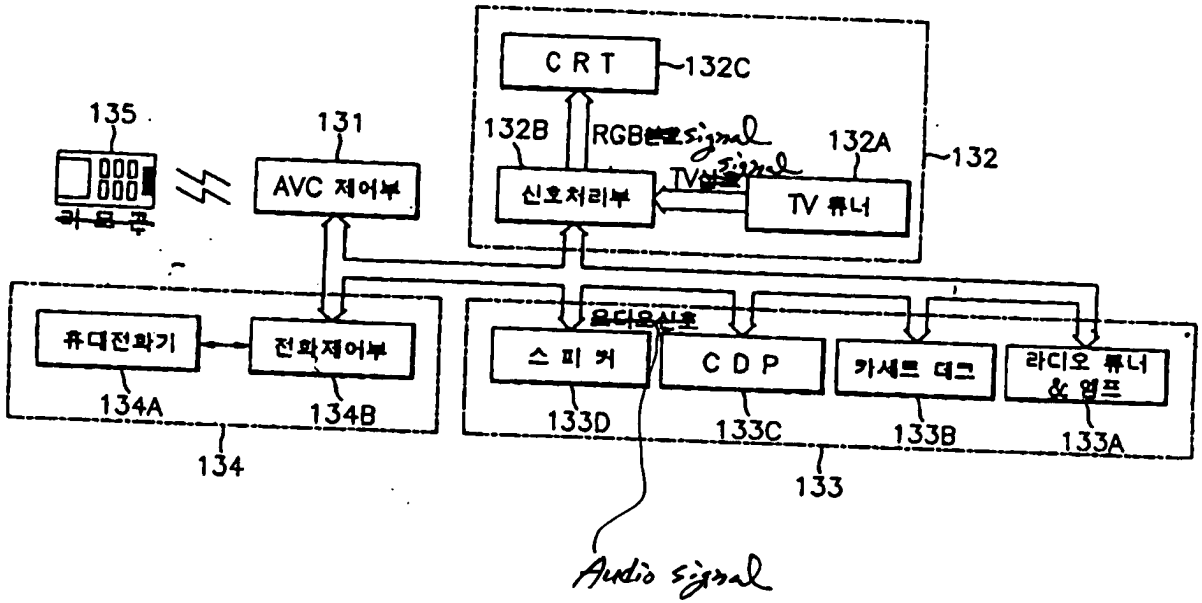


Fig. 2



131 AVC control unit

132A TV tuner

132B signal processing unit

133A radio tuner & amp

133B cassette deck

133C CDP

133D speaker

134A mobile phone

134B phone control unit

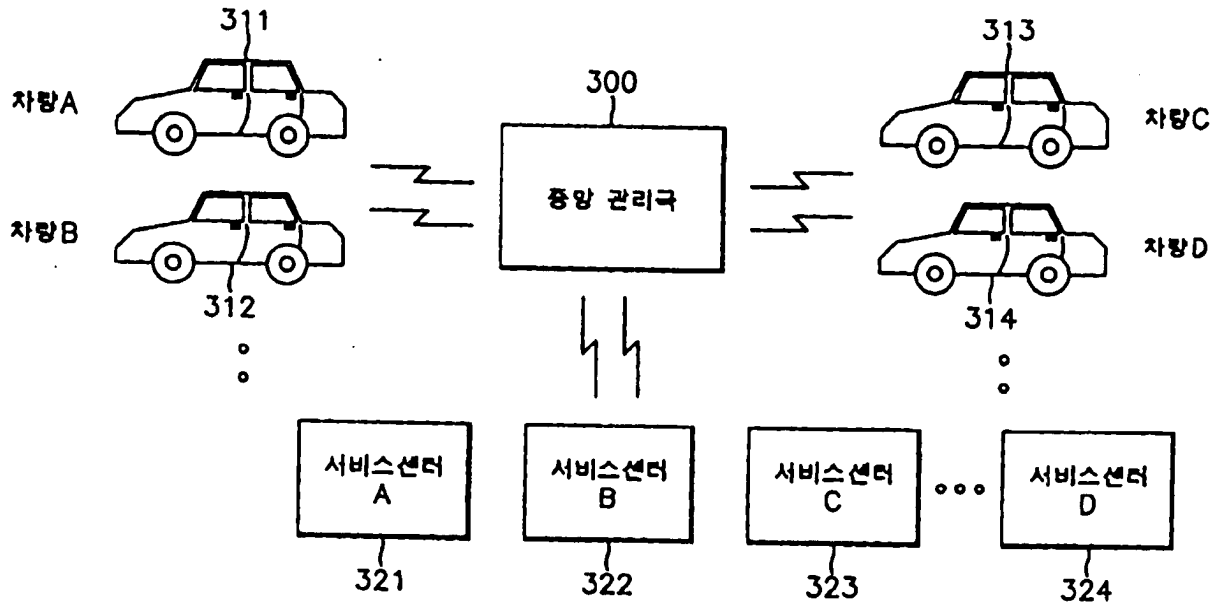
135 remote control

Figure 3

300 central control station

311, 312, 313, 314 vehicle A, vehicle B, vehicle C, vehicle D

321, 322, 323, 324 service center A, service center B, service center C, service center D



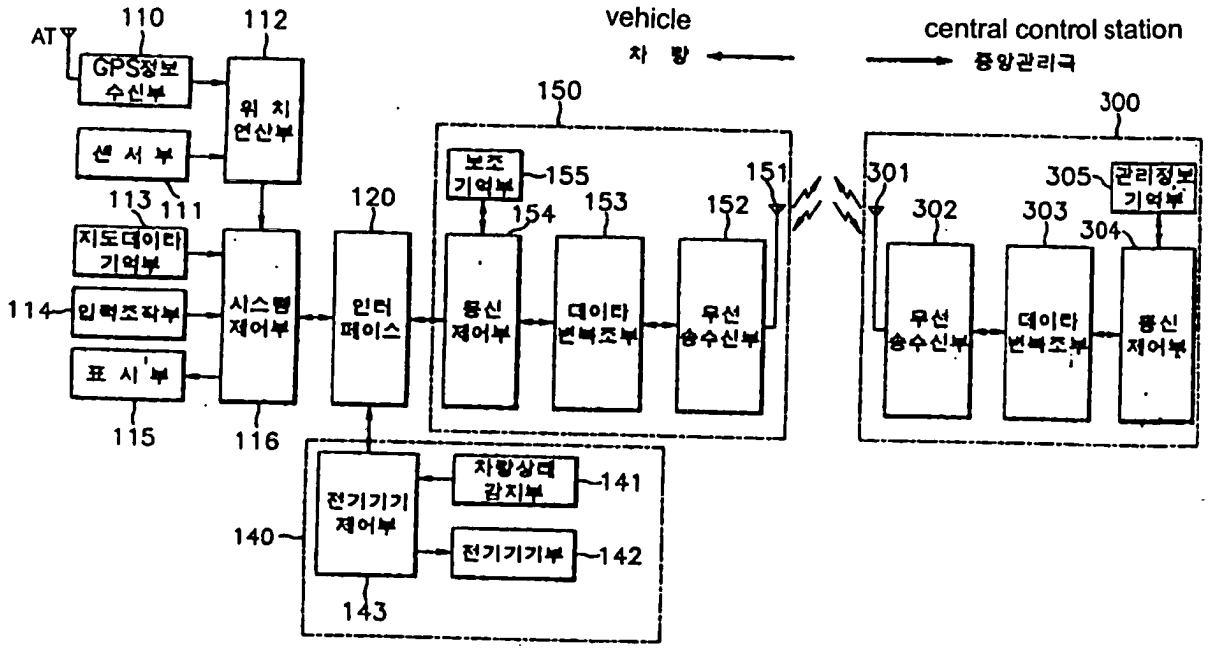


Figure 4

110 GPS information receiving unit

111 sensor unit

112 location computing unit

113 map data storage unit

114 input operating unit

115 display unit

116 system control unit

120 interface

141 vehicle state detection unit

142 electric equipment unit

143 electric equipment control unit

152 wireless transmission and reception unit

153 data modulator-demodulator unit

302 wireless transmission and reception unit

303 data modulator-demodulator unit

304 communication control unit

305 management information storage unit

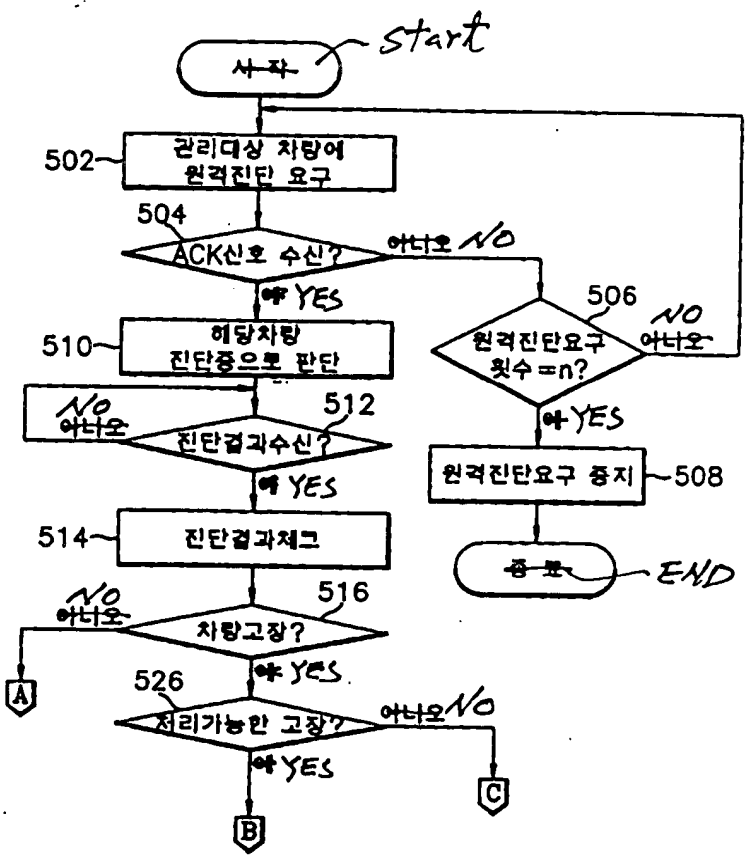


Figure 5A

502 requesting remote diagnosis to vehicle to be managed

504 ACK signal received?

506 number of remote diagnosis requests = n?

508 stopping remote diagnosis request

510 determining that corresponding vehicle is being diagnosed

512 diagnosis result received?

514 checking diagnosis result

516 vehicle is out of order?

526 troubles and malfunctions user can deal with?

Figure 5B

518 examining history of vehicle

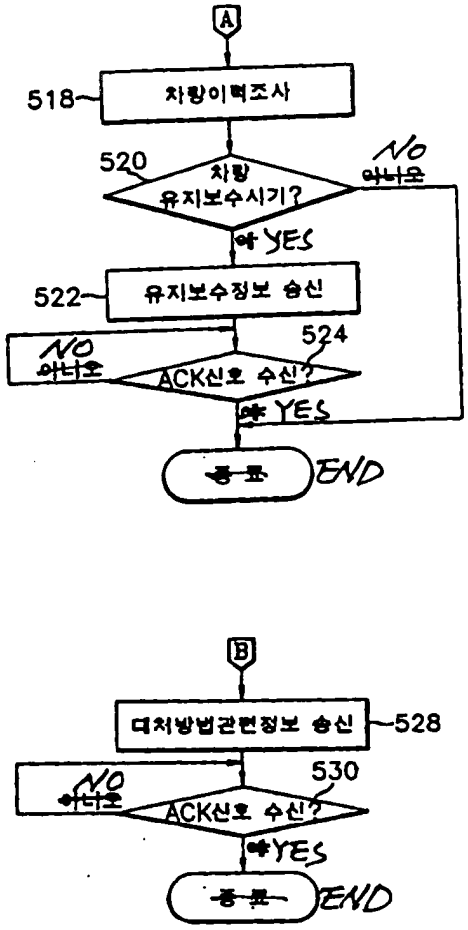
520 vehicle maintenance period?

522 sending maintenance information

524 ACK signal received?

528 sending troubleshooting information

530 ACK signal received?



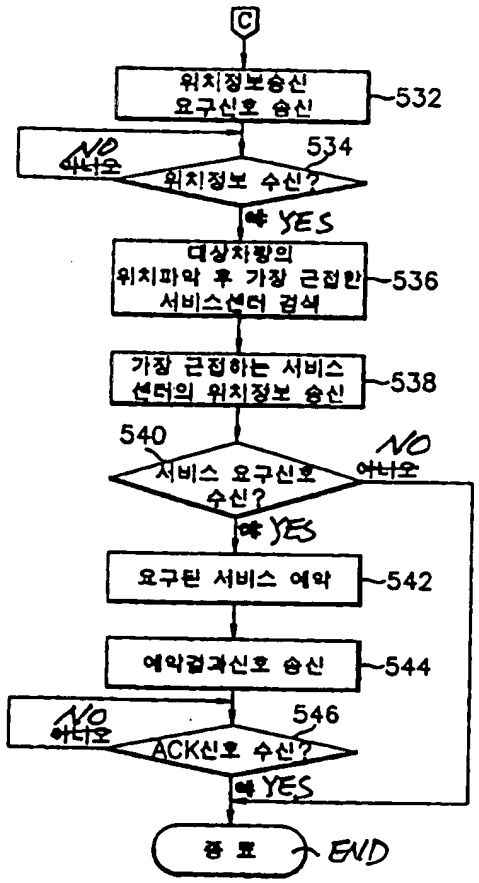


Figure 5C

532 sending location information transmission request signal

534 location information received?

536 searching for most adjacent service center after discovering location of target vehicle

538 sending location information of most adjacent service center

540 service request signal received?

542 making reservation for requested services

544 sending reservation result signal

546 ACK signal received?

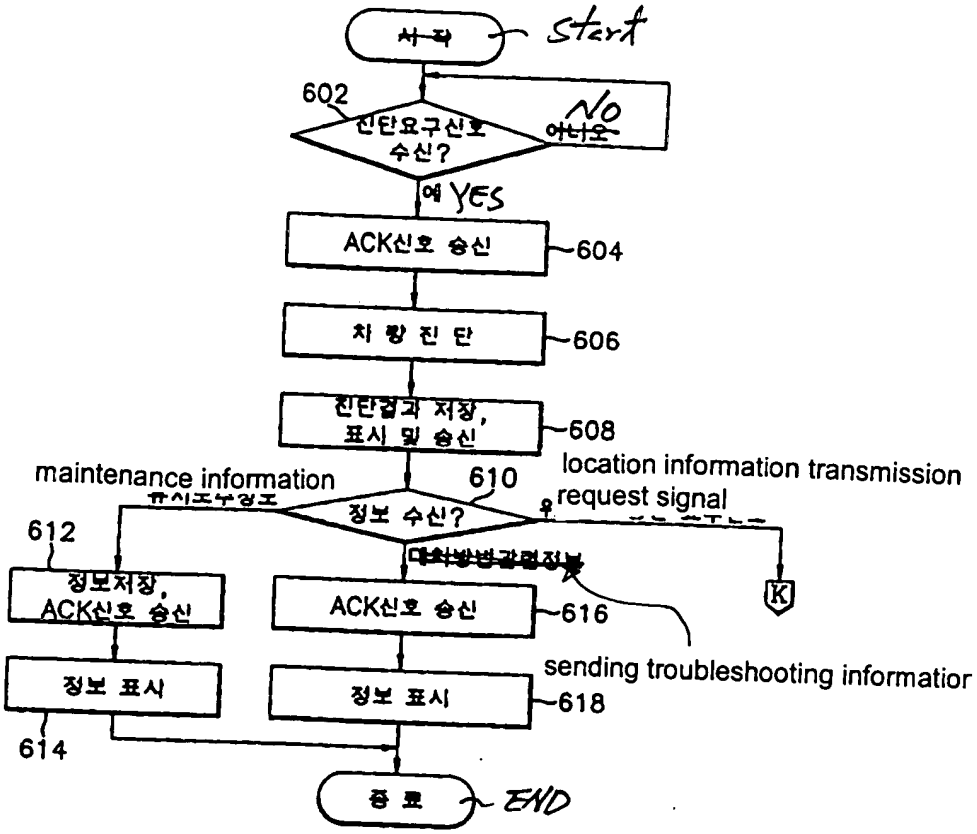


Figure 6A

602 diagnosis request signal received?

604 sending ACK signal

606 diagnosing vehicle

608 storing, displaying and sending diagnosis result

610 information received?

612 storing information and sending ACK signal

614 displaying information

616 sending ACK signal

618 displaying information

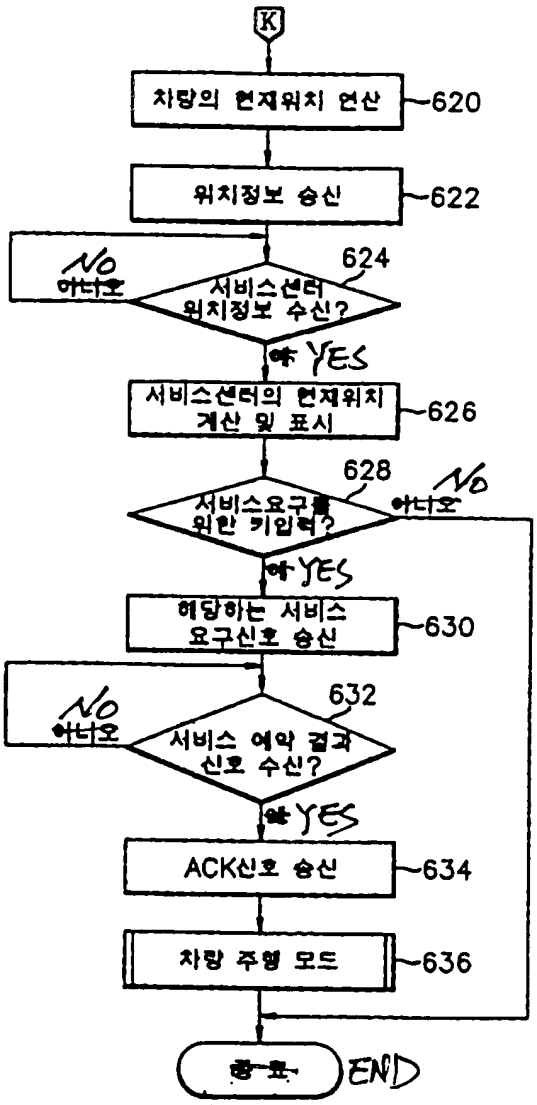


Figure 6B

620 computing present location of vehicle

622 sending location information

624 location information on service center received?

626 calculating and displaying present location of service center

628 key input for service request?

630 sending corresponding service request signal

632 service reservation result signal received?

634 sending ACK signal

636 vehicle driving mode